

On page 14 at line 15, please delete "associate" and replace it with - - associated - -.

On page 14 at line 16, after "path" please insert - - can be transferred - -.

On page 15 at line 2, please change "11(n)" to - - 11(n)) - -.

On page 15 at line 7, please change "malfunctioned." to - - malfunctioned) - -.

In the Claims

Please add the following claims 2-50.

Sub a. 1 2. A method of recovering from failures on a network having a plurality of nodes coupled by links over which data can be transferred between the nodes, each of a plurality of nodes storing information that associates links out of the node with destination nodes to which data can be transferred such that the node can forward data out of the node over a link to a next successive node toward an associated destination node, said method comprising:

for at least one of the nodes, generating and storing an alternate output route out of the node such that, in the event that data to be transferred toward a destination node cannot be forwarded to the next successive node over the link associated with the destination node, the at least one of the nodes can forward the data over the alternate output route toward the destination node; and

Sub b. 1 after generating and storing the alternate output route, if data to be transferred toward a destination node cannot be forwarded to the next successive node over the link associated with the destination node, forwarding the data over the alternate output route toward the destination node.

3. The method of claim 2 wherein the alternate output route is a connectionless route.

4. The method of claim 2 wherein the alternate output route defines an association between the next successive node and an alternate link out of the at least one of the nodes such that data intended to be forwarded to the next successive node can be forwarded over the

alternate link.

5. The method of claim 2 wherein the alternate output route is a connection-oriented route.
6. The method of claim 2 wherein the alternate output route is a bypass path through the at least one node to bypass the next successive node.
7. The method of claim 2 wherein the alternate output route is a bypass path through the at least one node to bypass a failed link out of the at least one node.
8. The method of claim 2 wherein the alternate output route is a connection-oriented route.
9. The method of claim 2 wherein the alternate output route is a bypass path through the at least one node to bypass the next successive node.
10. The method of claim 2 wherein the alternate output route is a bypass path through the at least one node to bypass a failed link out of the at least one node.
11. The method of claim 2 wherein data are forwarded over the alternate output route toward the destination node before other nodes on the network receive information that data cannot be transferred between the at least one of the nodes and the next successive node.
12. The method of claim 2 wherein data cannot be forwarded to the next successive node over the link because of a link failure.
13. The method of claim 2 wherein data cannot be forwarded to the next successive node over the link because of a node failure.
14. The method of claim 2 further comprising, after forwarding the data over the alternate

output route toward the destination node, providing to other nodes on the network information that data cannot be transferred between the at least one of the nodes and the next successive node.

15. The method of claim 14 wherein the information that data cannot be transferred between the at least one of the nodes and the next successive node includes a time at which nodes receiving the information should perform a recovery operation such that recovery operations at a plurality of nodes on the network are synchronized.

16. The method of claim 14 wherein the information initiates a recovery operation at at least one updating node on the network.

17. The method of claim 16 wherein the recovery operation comprises updating a routing table for the at least one updating node.

18. The method of claim 16 wherein the recovery operation comprises updating a virtual circuit route that includes the at least one updating node.

19. The method of claim 16 wherein recovery operations at a plurality of updating nodes are synchronized.

20. The method of claim 2 wherein at least one node of the network is capable of operating in both a connectionless environment and a connection-oriented environment.

21. The method of claim 2 wherein at least a portion of the network operates in a connectionless configuration.

22. The method of claim 2 wherein at least a portion of the network operates in a connection-oriented configuration.

cancel
23. The method of claim 2 wherein the network comprises at least a portion of a wide-area network.

sub
24. The method of claim 2 wherein the network comprises at least a portion of the Internet.

sub
25. The method of claim 2 wherein the network comprises at least a portion of an intranet.

sub
26. The method of claim 2 wherein the network comprises at least a portion of an extranet.

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a a 1
or 1 x*
27. An apparatus for recovering from failures on a network having a plurality of nodes coupled by links over which data can be transferred between the nodes, each of a plurality of nodes storing information that associates links out of the node with destination nodes to which data can be transferred such that the node can forward data out of the node over a link to a next successive node toward an associated destination node, said apparatus comprising:

means for generating and storing, for at least one of the nodes, an alternate output route out of the node such that, in the event that data to be transferred toward a destination node cannot be forwarded to the next successive node over the link associated with the destination node, the at least one of the nodes can forward the data over the alternate output route toward the destination node; and

means for forwarding the data over the alternate output route toward the destination node after generating and storing the alternate output route, if data to be transferred toward a destination node cannot be forwarded to the next successive node over the link associated with the destination node.

28. The apparatus of claim 27 wherein the alternate output route is a connectionless route.

29. The apparatus of claim 27 wherein the alternate output route is a connection-oriented

route.

sub C1

30. The apparatus of claim 27 wherein data are forwarded over the alternate output route toward the destination node before other nodes on the network receive information that data cannot be transferred between the at least one of the nodes and the next successive node.

31. The apparatus of claim 27 wherein data cannot be forwarded to the next successive node over the link because of a link failure.

32. The apparatus of claim 27 wherein data cannot be forwarded to the next successive node over the link because of a node failure.

33. The apparatus of claim 27 further comprising, means for providing to other nodes on the network after data are forwarded over the alternate output route toward the destination node, information that data cannot be transferred between the at least one of the nodes and the next successive node.

34. The apparatus of claim 33 wherein the information that data cannot be transferred between the at least one of the nodes and the next successive node includes a time at which nodes receiving the information should perform a recovery operation such that recovery operations at a plurality of nodes on the network are synchronized.

varie

35. The apparatus of claim 27 wherein the network comprises at least a portion of a wide-area network.

36. The apparatus of claim 27 wherein the network comprises at least a portion of the Internet.

sub F1

37. The apparatus of claim 27 wherein the network comprises at least a portion of an intranet.

38. The apparatus of claim 27 wherein the network comprises at least a portion of an extranet.

39. A method of recovering from failures on a network having a plurality of nodes coupled by links over which data can be transferred between the nodes, each of a plurality of nodes storing information that associates links out of the node with destination nodes to which data can be transferred such that the node can forward data out of the node over a link to a next successive node toward an associated destination node, said method comprising providing to other nodes on the network, in the event that data to be transferred toward a destination node cannot be forwarded to the next successive node over the link associated with the destination node, information that data cannot be transferred between the at least one of the nodes and the next successive node, said information including a time at which nodes receiving the information should perform a recovery operation such that recovery operations at a plurality of nodes on the network are synchronized.

40. The method of claim 39 wherein the recovery operation comprises updating a routing table for at least one updating node on the network.

41. The method of claim 39 wherein the recovery operation comprises updating a virtual circuit route that includes at least one updating node on the network.

42. The method of claim 39 wherein at least a portion of the network operates in a connection-oriented configuration.

43. The method of claim 39 wherein at least a portion of the network operates in a connectionless configuration.

44. The method of claim 39 wherein at least one node on the network is capable of operating in both a connectionless environment and a connection-oriented environment.

45. The method of claim 39 further comprising:

for at least one of the nodes on the network, generating an alternate output route out of the node such that, in the event that data to be transferred toward a destination node cannot be forwarded to the next successive node over the link associated with the destination node, the at least one of the nodes can forward the data over the alternate output route toward the destination node; and

if data to be transferred toward a destination node cannot be forwarded to the next successive node over the link associated with the destination node, forwarding the data over the alternate output route toward the destination node before a recovery operation is performed.

46. An apparatus for recovering from failures on a network having a plurality of nodes coupled by links over which data can be transferred between the nodes, each of a plurality of nodes storing information that associates links out of the node with destination nodes to which data can be transferred such that the node can forward data out of the node over a link to a next successive node toward an associated destination node, said apparatus comprising means for providing to other nodes on the network, in the event that data to be transferred toward a destination node cannot be forwarded to the next successive node over the link associated with the destination node, information that data cannot be transferred between the at least one of the nodes and the next successive node, said information including a time at which nodes receiving the information should perform a recovery operation such that recovery operations at a plurality of nodes on the network are synchronized.

47. The apparatus of claim 46 wherein at least a portion of the network operates in a